

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
24 February 2005 (24.02.2005)

PCT

(10) International Publication Number
WO 2005/017630 A1

(51) International Patent Classification⁷: **G03H 1/08**

(21) International Application Number:
PCT/IT2004/000380

(22) International Filing Date: 9 July 2004 (09.07.2004)

(25) Filing Language: Italian

(26) Publication Language: English

(30) Priority Data:
RM 2003 A 000398 13 August 2003 (13.08.2003) IT

(71) Applicant (for all designated States except US): **CONSIGLIO NAZIONALE DELLE RICERCHE** [IT/IT];
Piazzale Aldo Moro 7, I-00185 Roma (IT).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **COPPOLA, Giuseppe** [IT/IT]; Consiglio Nazionale delle Ricerche, Piazzale Aldo Moro 7, I-00185 Roma (IT). **DE NICOLA, Sergio** [IT/IT]; Consiglio Nazionale delle Ricerche, Piazzale Aldo Moro 7, I-00185 Roma (IT). **FERRARO, Pietro** [IT/IT]; Consiglio Nazionale delle Ricerche, Piazzale Aldo

Moro 7, I-00185 Roma (IT). **FINIZIO, Andrea** [IT/IT]; Consiglio Nazionale delle Ricerche, Piazzale Aldo Moro 7, I-00185 Roma (IT). **PIERATTINI, Giovanni** [IT/IT]; Consiglio Nazionale delle Ricerche, Piazzale Aldo Moro 7, I-00185 Roma (IT).

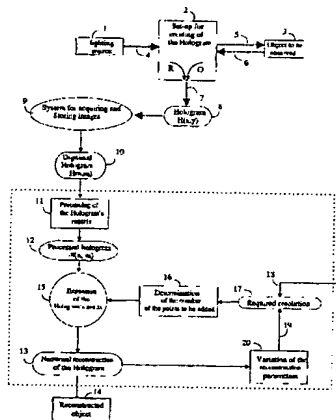
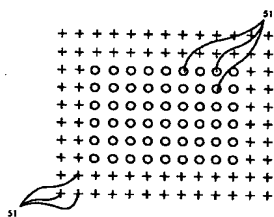
(74) Agents: **IANNONE, Carlo, Luigi et al.**; Ing. Barzanò & Zanardo Roma S.p.A., Via Piemonte, 26, I-00187 Rome (IT).

(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM),

[Continued on next page]

(54) Title: METHOD FOR MODIFYING SPATIAL RESOLUTION IN THE RECONSTRUCTION OF IMAGES IN DIGITAL HOLOGRAPHY



(57) Abstract: The invention concerns a method for the reconstruction of holographic images in digital holography, the holographic images being detected and transformed in a digitized hologram by an image detection device, the digitized hologram being made of an array having a number V_r of elementary pixels, the sizes of which being equal to the sampling intervals of the image detection device, the method comprising a first step of processing the digitized hologram array (e.g. zero-order elimination, aberration correction), and a second step of digitally reconstructing the complex object in an observation plane starting from the digitized hologram processed in the first step, the method being characterised in that the second step is carried out through discrete Fresnel Transform applied on an array of V_e pixels having sizes equal to that of said elementary pixels, wherein said array of V_e pixels (50, 51) includes said V_r pixels (51) and an interger number $p=V_e-V_r>0$ constant values (50). The invention further concerns the instruments necessary to the execution of the method and the apparatus executing it.



European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

— *before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments*

Published:

— *with international search report*

For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.